

IN THE UNITED STATES DISTRICT COURT  
FOR THE NORTHERN DISTRICT OF OKLAHOMA

STATE OF OKLAHOMA, *et al.*, )

*Plaintiffs,* )

v. )

TYSON FOODS, INC., *et al.*, )

*Defendants.* )

Case No. 4:05-cv-00329-GKF-PJC

**DEFENDANTS' RESPONSE TO STATE OF OKLAHOMA'S**  
**MOTION IN LIMINE TO PRECLUDE EXPERT TESTIMONY OF**  
**DEFENDANTS' WITNESS VICTOR BIERMAN, Ph.D.**

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The undersigned Defendants respectfully request that the Court deny the State of Oklahoma's Motion in Limine to Preclude Expert Testimony of Defendants' Witness Victor Bierman, Ph.D., Dkt. No. 2063. Plaintiff State of Oklahoma (the "State") challenges the admissibility of expert opinions offered by Dr. Bierman, stating that they are not reliable. However, the State's arguments are non-starters and do not provide a basis for this Court to exclude Dr. Bierman's expert testimony. Therefore, the Court should deny the State's motion in limine.

### **LEGAL STANDARD**

In determining whether to allow expert testimony, federal courts are bound by Federal Rule of Evidence 702, as well as *Daubert v. Merrell Dow Pharmaceuticals, Inc.* 509 U.S. 579, 587 (1993) and its progeny. Rule 702 sets forth specific criteria which the court must evaluate prior to the admission of expert testimony, providing as follows:

If scientific, technical, or other specialized knowledge will assist the trier of fact to understand the evidence or to determine a fact in issue, a witness qualified as an expert by knowledge, skill, experience, training, or education, may testify thereto in the form of an opinion or otherwise.

To determine whether an expert opinion is reliable, the court performs a two-step analysis involving both the relevance and the reliability of the testimony. *Investors I, L.P. v. Square D Co.*, 470 F.3d 985, 990 (10th Cir. 2006).

#### **Relevance**

Rule 702's requirement that the evidence or testimony "assist the trier of fact to understand the evidence or to determine a fact in issue" goes to the relevance of the testimony; "expert testimony which does not relate to any issue in the case is not relevant and, ergo, nonhelpful." *Daubert*, 509 U.S. at 591. The requirements that expert testimony proffered in a case must be specifically tied to the facts of the case and that such testimony must assist the jury in resolving a

factual dispute are also referred as to “fitness” and “helpfulness,” respectively. *Id.* Fitness can be difficult to determine, as scientific validity for one purpose is not necessarily scientific validity for another unrelated purpose. *Id.* A court may exclude scientifically reliable evidence and testimony where it is not directly relevant to the particular matter disputed at trial, and would not therefore “assist the trier of fact as required by Rule 702.” *United States v. Charley*, 189 F.3d 1251, 1267 (10th Cir. 1999).

### **Reliability**

*Daubert* expanded on the guidance provided by Rule 702 and assigned a “gate keeping” role to trial judges, which requires the court to ensure that any and all expert testimony or evidence that is admitted is not only relevant, but also reliable. *Daubert*, 509 U.S. at 589. First, the court must determine whether the expert is qualified by “knowledge, skill, experience, training, or education” to render an opinion. *Id.* Although *Daubert* required that the subject of the expert’s testimony be “scientific knowledge,”<sup>1</sup> as a threshold by which to judge evidentiary reliability, the Court in *Kumho Tire v. Carmichael* held that Rule 702 makes no distinction between “scientific” knowledge and “technical” or “other specialized” knowledge, thus allowing these other types of expert knowledge to be used in testimony as well. *Kumho Tire Co. v. Carmichael*, 526 U.S. 137, 147 (1999).

It is clear that an expert must have expertise specifically related to the opinion testimony he intends to offer. In *Ralston v. Smith & Nephew Richards, Inc.*, the court held that an expert must stay “within the reasonable confines of his subject area.” 275 F.3d 965, 970 (10th Cir. 2001) (citing *Compton v. Subaru of America, Inc.*, 82 F.3d 1513, 1520 (10th Cir. 1996)). Relying on *Ralston*, this Court stated that “it should be borne in mind that ‘[t]he issue with

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<sup>1</sup> Scientific knowledge was defined as a process by which theoretical explanations about the world are subject to further testing and refinement. *Daubert*, 509 U.S. at 590.

regard to expert testimony is not the qualifications of a witness in the abstract, but whether those qualifications provide a foundation for a witness to answer a specific question.”’ *In re Williams Securities Litigation*, 496 F.Supp.2d 1195, 1232 (N.D. Okla. 2007) (citing *Berry v. City of Detroit*, 25 F.3d 1342, 1351 (6th Cir. 1994), *cert. denied*, 513 U.S. 1111, 115 S.Ct. 902, 130 L.Ed.2d 786 (1995)). This Court further stated that an expert’s qualifications must be “specific to the matters he proposes to address as an expert.” *Id.*

The second step of the court’s reliability analysis is to decide whether the expert’s opinion testimony satisfies certain principles set forth in *Daubert. Investors*, 470 F.3d at 990. In determining whether a particular scientific theory is reliable, the court may consider several nondispositive factors: (1) whether the proffered theory can and has been tested; (2) whether the theory has been subject to peer review; (3) whether there is a known or potential rate of error and whether there are standards controlling the methodology’s operation; and (4) whether the theory has been accepted in the relevant scientific community. *Daubert*, 509 U.S. at 593-94. This list of factors was meant to be helpful, rather than definitive. *Kumho*, 526 U.S. at 151. *Kumho* further explains that the factors mentioned in *Daubert* cannot be ruled in or out for certain varieties of cases because too much depends on the circumstances of the particular case at issue. *Id.* at 150. The trial court retains broad discretion in assessing an expert’s reliability and making an ultimate determination of reliability. *Oklahoma v. Tyson Foods, et al.*, Case No. 08-5154, p. 16 (10th Cir. May 13, 2009). Therefore, a trial judge should consider those specific *Daubert* factors that are reasonable measures of the reliability of the expert’s testimony. *Kumho*, 526 U.S. at 151.

## ARGUMENT

At issue here are Dr. Bierman's opinions regarding the expert opinions offered by Dr. Bernard Engel. Dr. Bierman's expert report contains opinions regarding three aspects of Dr. Engel's report: (1) "the soundness of the underlying science in the models developed by Dr. Engel and the appropriateness of these models for the IRW and the opinions [Dr. Engel] puts forth;" (2) "the quality and quantity of the available data, and how these data were used by Dr. Engel to apply his models;" and (3) "the degree to which the results of Dr. Engel's models correspond to reality." Expert Report of Victor J. Bierman, Jr., Ph.D. ("Bierman Report"), p. 3 (relevant portions attached hereto as Exh. 1). The State claims that Dr. Bierman lacks experience in areas relevant to Dr. Engel's work, that he did not conduct an analysis of the IRW, and that he did not perform any tests to determine whether his criticisms would impact Dr. Engel's modeling results. Plaintiff State of Oklahoma's Motion in Limine to Preclude Expert Testimony of Defs.' Witness Victor Bierman, Ph.D. ("State's Motion"), p. 2. The State claims that these alleged deficiencies preclude the admission of Dr. Bierman's expert opinion testimony at trial. *See generally, id.*

### **A. Dr. Bierman has sufficient personal knowledge regarding the Illinois River Watershed**

The State first argues that Dr. Bierman has no personal experience of studying or gathering data in the IRW. State's Motion, p. 6.<sup>2</sup> In fact, Dr. Bierman is well acquainted with

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<sup>2</sup> The citations provided by the State which supposedly support its statement that Dr. Bierman has no personal experience of studying or gathering data in the IRW do not actually relate to such an allegation. Rather, they focus solely on Dr. Bierman's prior experience with runoff modeling. Despite the State's lack of valid support for its allegation, Defendants offer the following as evidence of Dr. Bierman's familiarity with the IRW.

the IRW, and the State's argument provides no basis for the exclusion of Dr. Bierman's expert testimony.

In June of 2006, Dr. Bierman spent several days thoroughly touring the IRW. *See* Exh. 2, Deposition of Victor J. Bierman ("Bierman Dep."), p. 86:11 – p. 87:5. He not only took an aerial tour of the IRW, but he also took a driving tour of the watershed and floated two separate sections of the Illinois River in Oklahoma. *Id.* During the driving tour and float trip, Dr. Bierman was able to observe creeks, streams, tributaries, recreational areas, Lake Francis, Lake Tenkiller, various municipalities, and industry and agriculture throughout the watershed. Exh. 2, Bierman Dep., p. 87:15 – p. 88:17.

Additionally, before undertaking any specific analysis of Dr. Engel's work, Dr. Bierman reviewed data and reports relating to the IRW that were generated outside of this litigation in an effort to learn about the watershed. Exh. 2, Bierman Dep., p. 124:18 – p. 125:2. As an additional example of Dr. Bierman's efforts to become familiar with the watershed, he and his team conducted analyses of data relating to phosphorus concentrations in the water upstream and downstream of Lake Francis. *Id.*, p. 125:3-16. They also conducted exploratory analyses wherein they computed the phosphorus load at several different locations in the IRW. *Id.*, p. 126:24 – p. 127:7.

Lastly, Dr. Bierman has read numerous reports generated as a result of this litigation, including those of the Plaintiffs' and Defendants' experts, which contain information regarding conditions in the IRW. Exh. 2, Bierman Dep., p. 89:11-15; p. 128:25 – p. 129:21.

**B. Dr. Bierman has the requisite knowledge and experience to testify regarding Dr. Engel's watershed modeling**

The State argues that Dr. Bierman has no general experience in runoff modeling and that he is not an expert in watershed hydrology, two areas in which the State claims that Dr.



Bierman must have experience in order to evaluate the accuracy of Dr. Engel's modeling and whether Dr. Engel's work accurately predicts nutrient runoff in the IRW. State's Motion, p. 6. This argument is flawed for several reasons. Dr. Engel's opinions do not rest solely upon runoff modeling, but also upon a receiving water model that he calls a routing model. Dr. Bierman has spent his entire career - 35 years – working with receiving water models such as the routing model developed by Dr. Engel specifically for this litigation. Additionally, the science underlying Dr. Engel's runoff model is identical to the scientific principles supporting other types of models, many of which Dr. Bierman has worked with extensively. Lastly, Dr. Bierman does have experience in hydrology.

In his deposition, Dr. Bierman acknowledged that his expertise does not relate primarily to runoff modeling. Exh. 2, Bierman Dep., p. 155:15–19.<sup>3</sup> However, the State ignores the fact that Dr. Engel's opinions rest largely upon the results of *two* models: a hydrologic computer model known as GLEAMS<sup>4</sup> and a phosphorus routing model that he developed and

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<sup>3</sup> Dr. Bierman does have experience with evaluation of runoff modeling. With respect to the Caloosahatchee River estuary, Dr. Bierman engaged in a review of watershed and water quality models. In this project, Dr. Bierman conducted an independent scientific review of a watershed receiving water model coupled with a watershed model that encompassed non-point source runoff. The Florida Department of Environmental Protection applied these models to the entire Caloosahatchee River watershed. In that case, Dr. Bierman was personally involved in the evaluation of the runoff model, which involved assessment of input data, site-specific application, calibration results, and comparisons of model output to data. Exh. 2, Bierman Dep., p. 64:3 – p. 65:18. Additionally, in a project entitled "Peer Review of a Linked HSPF-AQUATOX Modeling System," for which Dr. Bierman was contracted by the U.S. EPA to review a coupled watershed receiving water modeling system, Dr. Bierman himself performed the entire review of the runoff analysis, as well as the receiving water analysis. *Id.*, p. 71:1–20; p. 72:20–24.

<sup>4</sup> GLEAMS (Groundwater Loading Effects of Agricultural Management Systems) is a field-scale hydrologic model originally developed by the University of Georgia to model transport of substances from agricultural fields to groundwater. Exh. 1, Bierman Report, p. 4.

used for the first time in connection with this case.<sup>5</sup> Dr. Engel did not use only a runoff model. In his deposition, Dr. Bierman identified numerous projects on which he has worked which involved models such as the routing model used by Dr. Engel. *See* Exh. 2, Bierman Dep., p. 18:4 – p. 19:24 (describing a project in which Dr. Bierman’s work involved the impact of loadings on the receiving water body – the Calumet River), p. 38:18 – p. 39:5 (describing a project involving Saginaw Bay and watershed and receiving water body models), p. 64:3 – p. 66:15 (describing Dr. Bierman’s work relating to the Caloosahatchee River estuary, wherein he conducted an independent scientific review of a coupled watershed receiving water model), p. 66:18 – p. 67:4 (describing a project relating to the Chesapeake Bay program, with which Dr. Bierman has been involved for over twenty years and in which his work has involved review of a very advanced, sophisticated coupled watershed receiving water modeling system), and p. 71:1 – p. 72:24 (describing a project in which the U.S. EPA contracted Dr. Bierman to conduct an independent scientific peer review of a coupled watershed receiving water modeling system).

Further, the State ignores the fact that the GLEAMS model used by Engel – a runoff model – is at its core, a mass-balance model. Dr. Bierman has stated that field scale runoff models, such as GLEAMS, watershed models, and most receiving water models are all process-

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<sup>5</sup> What Dr. Engel calls his “routing model” is an equation that he and Dr. Ji-Hong developed for this case to force the combined known point source loads in the IRW and the predicted nonpoint source loads simulated by GLEAMS to match the estimated total phosphorus loads that reach the three USGS gauging stations in the IRW that are closest to Lake Tenkiller. The “routing model” equation used by Dr. Engel and Dr. Ji-Hong is:  $P \text{ Load to Lake} = a + b * Q * P \text{ Accumulation} + c * Q^2 * P \text{ Accumulation}$ . Exh. 3, Engel Rpt. (5/22/08), p. D-21. Dr. Engel admitted in his deposition that his routing model has no physical meaning and does not represent or simulate the actual physical processes in the IRW that determine in the real world whether a molecule of phosphorus entering a stream at a particular location will be transported downstream to Lake Tenkiller. Exh. 4, Deposition of Bernard Engel (“Engel Dep.”), p. 191:10-11 (“It’s not modeling those physical processes.”) and p. 188:21-25 (“Q. Does your phosphorus routing model include any physically based parameters that would assist you in allocating phosphorus back to sources in the watershed? A. No . . .”).

based finite volume mass balance models and that they all embody identical scientific principles. Exh. 2, Bierman Dep., p. 155:23 – p. 156:7. Dr. Bierman has in excess of thirty years of experience in working with mass-balance models. Exh. 2, Bierman Dep., p. 155:19–22 (stating that for 35 years, he has developed, applied, used and reviewed deterministic process-based mass balance models). Further, the State ignores the fact that one does not have to be the person who physically runs a model in order to have knowledge about the scientific principles underlying that model and to be able to identify flaws in the modeling methodology. It is interesting to note that Dr. Engel himself has only run his GLEAMS model five to eight times. *See* Exh. 4, Engel Dep., p. 45:2 – p. 46:25 (stating that he actually only ran the model during the calibration stage and that the model was ultimately run hundreds of thousands or millions of times). Dr. Bierman has similarly run Dr. Engel’s GLEAMS model himself half a dozen times. Exh. 2, Bierman Dep., p. 81:20 – p. 82:2. Aside from the fact that Dr. Bierman has actual hands-on experience with the GLEAMS model, as well as other general experience evaluating runoff models, Dr. Bierman is clearly knowledgeable regarding the science underlying Dr. Engel’s modeling work.

The State also claims that Dr. Bierman is not an expert in watershed hydrology.<sup>6</sup> It is true that although Dr. Bierman has had courses in hydrology, he would not characterize himself as a hydrologist. Bierman Dep., p. 80:17-19. Dr. Bierman explained in his deposition that the label “hydrologist” would normally be applied “to someone who is trained in hydrology, who practices in hydrology, and whose knowledge and practice are by and large limited to hydrology.” Exh. 2, Bierman Dep., p. 80:20-23. Dr. Bierman’s expertise, which is

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<sup>6</sup> It is important to note that, similarly, Dr. Engel is not a hydrologist. None of Dr. Engel’s degrees is in hydrology. *See* Exh. 5, Curriculum Vitae of Dr. Bernard Engel. Additionally, Dr. Engel’s own website fails to identify hydrology as one of his areas of specialty. *Available at* <http://cobweb.ecn.purdue.edu/~engelb/> (last visited June 4, 2009).

interdisciplinary and multidisciplinary, does not require him to be a hydrologist – it only requires him to have knowledge of hydrology. Exh. 2, Bierman Dep., p. 80:24 – p. 81:8.

It is clear that Dr. Bierman has experience and knowledge sufficient to allow him to issue valid expert opinions regarding Dr. Engel's work. Simply because he has not concentrated his entire body of work on runoff modeling and simply because he does not apply the label "hydrologist" to himself does not preclude his offering such testimony in this action.

### **C. Dr. Bierman did test the criticisms he makes of Dr. Engel's IRW model**

The State contends that Dr. Bierman's opinions must be excluded because he "offers no analysis or authority to support his opinions that criticize Dr. Engel's watershed modeling" and because Dr. Bierman "did not work to determine if his criticisms of Dr. Engel's work made any material difference in the modeling outcome." State's Motion, p. 6.<sup>7</sup> With this contention, the State seems to indicate that Dr. Bierman was required to create his own models to test the validity of his opinions. Such a position is simply untenable. Dr. Bierman's job in this case was not to do Dr. Engel's job for him by creating models which would accurately predict conditions in the IRW; rather, Dr. Bierman was tasked with detailing flaws in the models used and developed by Dr. Engel.<sup>8</sup> Additionally, the State fails to acknowledge that Dr. Bierman did do

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<sup>7</sup> The State asserts that Dr. Bierman failed to identify any peer reviewed publication supporting his opinions on Dr. Engel's watershed model. State's Motion, p. 7. However, in support of his opinion that "Dr. Engel did not follow his own published guidance on procedures for standard application of hydrologic/water quality models," Dr. Bierman cited a peer-reviewed article entitled "A Hydrologic/Water Quality Model Application Protocol," authored by Dr. Engel, Dan Storm, Mike White, Jeff Arnold, and Mazdak Arabi. See Exh. 1, Bierman Report, p. 21. The article was published in the *Journal of the American Water Resources Association*, October 2007, Volume 43, No. 5, Pages 1223-1236.

<sup>8</sup> Dr. Bierman explained this in his deposition stating that his contention is that Dr. Engel's "routing model is not a representation of the real system of streams and rivers." Exh. 2, Bierman Dep., p. 237:17–22. Dr. Bierman does not "need to apply an alternate model to form that opinion." *Id.*, p. 237:22-23.

extensive sensitivity analyses on Dr. Engel's models, which demonstrated the flaws in Dr. Engel's modeling work that Dr. Bierman identifies in his report.

The U. S. EPA recognizes that the most common and generally accepted evaluation methods to corroborate hydrologic models, like those used by Dr. Engel, include sensitivity analysis. Exh. 6, EPA Guidance (2009), pp. 19-31, 69-75. Dr. Bierman explains that "sensitivity analysis investigates how model outputs are affected by changes in selected model inputs." Exh. 1, Bierman Report, p. 16. The EPA recommends conducting sensitivity analysis as a part of hydrologic modeling in order to identify and characterize potential sources of uncertainty in the model results. Exh. 6, EPA Guidance (2009), pp. 69-70. In his deposition, Dr. Engel admitted that he conducted no sensitivity analysis with respect to his use of the GLEAMS model on the IRW. Exh. 4, Engel Dep., p. 291:9-19; p. 464:2-11. This is a surprising turn of events given that six years ago, Dr. Engel testified in this very Court as to the importance of conducting sensitivity analysis on hydrologic models. Exh. 7, *City of Tulsa v. Tyson Foods, Inc., et al.*, Hrg. Tr., p. 462 ("certainly a sensitivity analysis . . . and observing what happens in the model response would be helpful . . . to better identify the impact of some of those kinds of assumptions and how those would impact how you attribute the phosphorus sources."); and p. 466 ("There was limited parameter sensitivity analysis that was conducted here. I would have liked to have seen more of that."). After criticizing a colleague for conducting "limited" sensitivity analysis, Dr. Engel has now put before the Court a model in which he conducted "no sensitivity analysis" whatsoever.



To demonstrate the lack of utility and reliability in Dr. Engel's models, Dr. Bierman was tasked with performing sensitivity analysis using different input data with Dr. Engel's models.<sup>9</sup> In one test, Dr. Bierman reversed the predicted phosphorus loads from GLEAMS for the time period of 1986-2006 and then re-ran Dr. Engel's phosphorus routing model. Dr. Bierman obtained essentially the same results at Lake Tenkiller as Dr. Engel. Exh. 1, Bierman Report, p. 29. As Dr. Bierman explains, "because predicted daily phosphorus loads from . . . GLEAMS are driven by rainfall events . . . this means that Dr. Engel's linked GLEAMS and routing model cannot tell the difference between rainy days and dry days in the IRW." *Id.* Another test run by Dr. Bierman confirmed that Dr. Engel's models are not impacted by changes in the human population in the IRW and resulting changes of the magnitude of point source discharges from wastewater treatment plants ("WWTPs"). To test this, Dr. Bierman increased the point source discharge assumed in these models by 345-fold to reflect 97 million people served by these WWTPs as opposed to Dr. Engel's estimated population of 280,000. When the models were re-run with these dramatic changes, the results in terms of estimated loads to Lake Tenkiller do not change materially. *Id.*, p. 30. In another test, Dr. Bierman confirmed that Dr. Engel's models cannot differentiate between phosphorus loads and completely random input values such as the S&P 500 index. *Id.*, p. 31 (using the completely random input of the reported S&P 500 daily index in the place of Dr. Engel's predicted phosphorus loads from sources within the IRW yields materially identical results at Lake Tenkiller). Finally, and most remarkably, Dr. Bierman

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<sup>9</sup> This is a commonly employed technique for testing the validity and uncertainty of models and their input data. Dr. Engel is well aware of this technique, having suggested something very similar to test the reliability of the hydrologic model under review in the *City of Tulsa* case. Exh. 7, *City of Tulsa v. Tyson Foods, Inc., et al.* Hrg. Tr., p. 466 ("it would be interesting to see what happens if we do take the defendants' chicken litter numbers and apply those at face value, see what the model predicts. There are many other assumptions of that sort or many other alterations of some of the data that could be made to explore how those propagate through the model and what net impact on the results that they may have.").

determined that he could add poultry litter from an additional two billion birds per year in the IRW to Dr. Engel's models and still achieve essentially the same estimated loadings to Lake Tenkiller. *Id.*, p. 30. Thus, Dr. Bierman engaged in in-depth evaluations of Dr. Engel's models which demonstrated that the models are not even capable of responding realistically to changes in the very source that they were intended to characterize and quantify. Although Dr. Bierman did not create his own models incorporating his criticisms of Dr. Engel's work, he certainly did test those criticisms and, without a doubt, demonstrated the fallibility of Dr. Engel's models.

**D. Dr. Bierman is qualified to offer expert opinion testimony regarding land use/land cover data and he did conduct testing to prove the validity of his criticisms of Dr. Engel's use of land use/land cover data**

The State asserts that Dr. Bierman has no experience in the evaluation of use of land cover data, and that therefore, Dr. Bierman's opinions should be excluded. In his deposition, Dr. Bierman stated that he personally does not have experience in interpreting aerial photos contained in the land use data used by Dr. Engel ("NLCD data"). Exh. 2, Bierman Dep., p. 313:3-5. However, Dr. Bierman further testified that he has "highly trained and competent GIS staff who have that experience in looking at NLCD images and making determinations about land use areas." *Id.*, p. 314:8-14. For example, Dr. Bierman's staff made the interpretations that residential urban land under development was classified by Dr. Engel as pasture land and that his staff explained to him the factors they used to make that determination. *Id.*, p. 317:19 - p. 318:1.

It is perfectly acceptable for an expert to rely upon work done by others. Federal Rule of Evidence 703 provides in part:

The facts or data in the particular case upon which an expert bases an opinion or inference may be those perceived by or made known to the expert at or before the hearing. If of a type reasonably relied upon by experts in the particular field in forming opinions or inferences upon the subject, the facts or data need not be admissible in evidence in order for the opinion or inference to be admitted.

It is not necessary that the expert have personal knowledge or expertise regarding the facts underlying his opinions. The Advisory Committee's Note to Rule 703 states that "[t]he third source contemplated by the rule consists of presentation of data to the expert . . . other than by his own perception" and further states that the rule brings "the judicial practice into line with the practice of the experts themselves when not in court." The Advisory Committee uses the example of a physician testifying in court. A physician in his day-to-day practice relies upon the opinions of nurses, technicians, and other doctors. He should be able to do the same in court, and "his validation, expertly performed and subject to cross-examination, ought to suffice for judicial purposes." Advisory Committee Note to Fed.R.Evid. 703 (citing Rheingold, *The Basis of Medical Testimony*, 15 Vand. L. Rev. 473, n. 9 (1962)).

It is important to note that with this argument, the State presents a criticism that, if valid, would equally apply to Dr. Engel. Dr. Engel used the work of his staff as the basis for opinions contained within his expert report. *See* Exh. 4, Engel Dep., p. 6:18 – p. 8:4 (Dr. Ji-Hong Jeon is a staff person that has worked directly with Dr. Engel on this case), p. 35:15-17 and p. 37:17 – p. 38:6 (Dr. Engel relied upon Dr. Ji-Hong to write the computer code for the calibration of his modeling, as well as computer code used to automate other various aspects of the analysis), p. 38:15–19 (Dr. Ji-Hong is the scientist who actually ran the GLEAMS model for Dr. Engel's work in this case), p. 38:20 – p. 39:18 (Dr. Ji-Hong made decisions regarding the set-up or configuration of the GLEAMS model without consulting Dr. Engel), and p. 41:19 – p. 42: 23 (Dr. Ji-Hong extracted and summarized data from the model output and provided that summarized data to Dr. Engel; it was not Dr. Engel's regular practice in this case to examine raw output data from the models). Clearly, it is reasonable for Dr. Bierman, as an expert, to rely upon analysis performed by his staff in issuing his expert opinions, just as Dr. Engel did.



The State also claims that Dr. Bierman performed no tests or analysis to determine if his criticisms of Dr. Engel's land use inputs made a material difference in the modeling outcome. This relates to Dr. Bierman's opinion that Dr. Engel used inaccurate inputs regarding land use data in his modeling work. *See* Exh. 1, Bierman Report, pp. 12-15 and Appendix B. Dr. Bierman's staff first identified these inaccuracies by conducting a "consistency check" between the NLCD primary data and Dr. Engel's files and noticed discrepancies. *See* Exh. 2, Bierman Dep., p. 313:22 – p. 314:2. Therefore, they investigated further and noticed a large number of discrepancies, some of which Dr. Bierman reported quantitatively in his report and some of which he simply showed illustrative examples in Figures 2 through 5 of his expert report. *Id.*, p. 314:2-7.

As Dr. Bierman explained in his report and deposition, it is common sense that because Dr. Engel did not use accurate land use inputs in his work, his results regarding loading would also be incorrect. Stated another way, "garbage in equals garbage out." Exh. 1, Bierman Report, p. 12. Dr. Bierman stated that this is because "different land uses have different runoff characteristics." Exh. 2, Bierman Dep., p. 313:6-15. As stated above, Dr. Bierman's task was not to correct Dr. Engel's work and generate accurate results from Dr. Engel's models; rather, his primary purpose was to identify flaws in Dr. Engel's methodologies, including the use of invalid input data. As such, it is not necessary that Dr. Bierman perform tests to determine whether using different input data would result in different modeling outcomes.

**CONCLUSION**

For the foregoing reasons, the Court should not grant the State of Oklahoma's Motion in Limine to Preclude Expert Testimony of Defendants' Witness Victor Bierman, Ph.D.

Respectfully submitted,

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